

CLAIMS

1. A sampling device for analysis of a substance, which is selected from the group consisting of isocyanates, aminoisocyanates, isothiocyanates, amines and carboxylic acids and which is present in both gas and particle phase in an air flow intended to pass through the sampling device, characterized in that it comprises

a) an adsorption device (1) intended for the passage of the air flow and provided with a coating of a mixture of a reagent in the form of primary or secondary amines and a carboxylic acid for adsorption of and reaction with the substance in the gas phase of the air flow,

b) a filter device (2) intended for the passage of the air flow and provided with the mixture of reagent and carboxylic acid for adsorption of and reaction with the substance in the particle phase of the air flow, and

c) a reagent container (4) containing the reagent,

the reagent container (4) being connected to the adsorption device (1) and/or the filter device (2) by means of a switch device (5) for conveying the reagent to these for reaction therein with the non-reacted substance.

2. A sampling device according to claim 1, characterized in that the adsorption device (1) is tubular in the air flow direction, the proportion of the length to the inner diameter being superior to 5, and preferably about 10.

3. A sampling device according to claim 2, characterized in that the inner walls of the adsorption device (1) are coated with the mixture of reagent and carboxylic acid.

4. A sampling device according to any one of the preceding claims, characterized in that the mixture contains one or more different carboxylic acids, preferably formic acid, acetic acid or propionic acid, or a combination thereof.

5. A sampling device according to any one of the preceding claims, characterized in that the reagent is di-n-butylamine (DBA).

5 6. A sampling device according to claim 1, characterized in that the primary or secondary amines are volatile in unbound form and each have a molecular weight inferior to 300.

10 7. A sampling device according to claim 1, characterized in that the adsorption device (1) has an upper end with an air inlet (6) and a lower end which is connected to an upper end of the filter device (2), the filter device (2) having a lower end with an air outlet (7).

15 8. A sampling device according to claim 7, characterized in that the sampling device is inverted in such manner that the air inlet (6) is arranged in the lower end of the filter device (2) and that the air outlet (7) is arranged in the upper end of the adsorption device (1).

20 9. A sampling device according to claim 1, characterized in that it is provided with a pump or suction device (3) to provide the passage of the air flow through the adsorption device (1) and the filter device (2), and that it is connected either to
25 the adsorption device (1) or to the filter device (2).

30 10. A sampling device according to claim 9, characterized in that the pump or suction device (3) is connected to the lower end of the filter device (2).

35 11. A sampling device according to claim 10, characterized in that the pump or suction device (3) is a vacuum tube or a displacement pump, preferably a hose pump, diaphragm pump, injection pump or gear-type pump.

12. A sampling device according to claim 1, characterized in that the adsorption device (1) consists of a body packed with

particles which are coated with the mixture of reagent and carboxylic acid.

13. A sampling device according to claim 1, characterized
5 in that the filter device (2) is formed as a substantially flat cylinder having a diameter which is greater than or equal to that of the adsorption device (1), that it contains particles which are coated with the reagent and mixed with carboxylic acid, and that it has an average pore diameter of 0.1-20 μm ,
10 preferably 0.2-2 μm , and most preferably 0.4 μm .

14. A sampling device according to claim 1, characterized in that the reagent container (4) is connected by means of the switch device (5) to the adsorption device (1) or the filter
15 device (2) for automatic conveyance thereto of reagent after completed sampling and closing of the air inlet (6) and the air outlet (7), respectively, for reaction with residual non-reacted substance in the sampling device.

20 15. A sampling device according to claim 2, characterized in that the reagent container (3) is arranged as a concentric tube round the adsorption device (2).

16. A sampling device according to claim 1, characterized
25 in that the adsorption device 1 and the filter device 2 are enclosed in a uniform casing having a closable air inlet (6) and outlet (7), respectively.

17. A kit comprising a plurality of sampling devices
30 according to any one of the preceding claims for taking samples from a plurality of the different substances at the same time or at different points of time, the reagent in each sampling device being selected for the substance with which it is to react in the air flow.

35 18. A method for immobilization of volatile primary and secondary amines, preferably di-n-butylamine, on a surface, characterized in that the volatile primary or secondary amine is

mixed with a carboxylic acid, preferably formic acid, acetic acid or propionic acid, and that the surface is subsequently coated with the prepared mixture.

5 19. A method according to claim 18, characterized in that one or more different primary and/or secondary amines, preferably di-n-butylamine, is/are immobilized in an adsorption device (1) and/or a filter device (2) in a sampling device or a kit according to any one of claims 1-17.

10 20. A method for taking samples from a substance, which is selected from the group consisting of isocyanates, aminoisocyanates, isothiocyanates, amines and carboxylic acids and which is present in both gas and particle phase in an air
15 flow, by means of a sampling device according to any one of claims 1-17, characterized in that it comprises the steps of

passing the air flow through the adsorption device (1) and the filter device (2) by means of the pump or suction device (3) for adsorption and reaction therein of the substance in both gas
20 phase and particle phase,

closing the inlet (6) and the outlet (7) of the sampling device after the passage of a predetermined volume of air, the switch device (5) associated with the reagent container (4) automatically securing conveyance of the reagent therein to the
25 adsorption device (1) and the filter device (2) for reaction therein with the residual, non-reacted substance, and of

finally subjecting the sampling device to a qualitative and/or quantitative analysis,

optionally carrying out an initial activation step, in
30 which the mixture of the reagent and the carboxylic acid is added to the adsorption device (1) and the filter device (2) immediately before the initiation of the sampling.

21. A method according to claim 15, characterized in that
35 isocyanates, aminoisocyanates, isothiocyanates, amines and carboxylic acids are adsorbed by and react with di-n-butylamine in the sampling device.

22. A method according to claim 16, characterized in that an air flow of 0.001-1 l/min, and preferably 10-100 ml/min, is passed through the sampling device.